EXPERIMENTAL AND THEORETICAL DETERMINATION OF HEAVY OIL VISCOSITY UNDER RESERVOIR CONDITIONS

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ABSTRACT

The USA deposits of heavy oils and tar sands contain significant energy reserves. Thermal methods, particularly steam drive and steam soak, are used to recover heavy oils and bitumen. Thermal methods rely on several displacement mechanisms to recover oil, but the most important is the reduction of crude viscosity with increasing temperature.

The main objective of this research is to propose a simple procedure to predict heavy oil viscosity at reservoir conditions as a function of easily determined physical properties. This procedure will avoid costly experimental testing and reduce uncertainty in designing thermal recovery processes.

We started reviewing critically the existing literature choosing the most promising models for viscosity determination. We selected a method developed by Perdersen and collaborators suitable to deal with 'black oils.' A change in the reference compound from methane to n-Decane was done. The complex chemical composition of these oils is represented by a set of global properties such as, boiling point, average molecular weights, API gravity. The viscosity of several oil samples provided by oil producers was predicted using our model. Viscosity, density and other necessary thermodynamic properties required in the evaluation of the selected models were determined in our laboratories or taken from literature. Various mixing rules and volume translation schemes that do not affect the phase equilibrium were tested to achieve better density predictions.

Next stage of our work will involve working with heavy oils with known chemical compositions.

Graduate and Undergraduate Students Involved in the Project:

Mr. Norman Alban is working on this research project since March 2000. Mr. Alban is developing a computer subroutine to be used in the comparison of viscosity values calculated using different methods.

Mr. Joseph Etsibah, a Prairie View A&M undergraduate student, has also worked during Academic year 2001-2002 on this project.